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Original Research Article

CLINICAL PROFILE AND PREDICTORS OF PROLONGED RESPIRATORY SUPPORT IN TRANSIENT TACHYPNEA OF THE NEWBORN AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Transient tachypnea of the newborn (TTN) is the most common neonatal respiratory disorder and an important cause of early NICU admission among late preterm and term infants. **Objective:** To describe the clinical profile of TTN and evaluate whether red cell distribution width (RDW) and platelet count are associated with prolonged respiratory support. **Methods:** A prospective observational study was conducted at Department of Pediatrics, Associated group of Hospitals, Government Medical College, Barmer, Rajasthan, India from January 2025 to December 2025. Neonates born at or beyond 34 weeks' gestation with respiratory distress beginning within 6 hours of birth and a final diagnosis of TTN were included after exclusion of sepsis, pneumonia, meconium aspiration syndrome, congenital heart disease, respiratory distress syndrome, and major anomalies. Clinical characteristics, complete blood count parameters, radiographic findings, oxygen duration, CPAP requirement, and NICU stay were assessed. **Results:** In this study, 126 neonates were enrolled. Of the 126 enrolled infants, 44 (34.9%) developed prolonged TTN, defined as respiratory distress lasting more than 48 hours. Infants with prolonged TTN had lower gestational age, lower birth weight, higher RDW, and lower platelet count than infants whose symptoms resolved within 48 hours. RDW greater than 17.4% yielded an area under the ROC curve of 0.76, while platelet count below 190 $\times 10^3$/ µL yielded an area under the ROC curve of 0.72. When RDW, platelet count, gestational age, and caesarean delivery were combined in a predictive model, the area under the ROC curve improved to 0.83. **Conclusion:** TTN is usually self-limited, but a clinically meaningful subgroup requires prolonged respiratory support. RDW and platelet count are inexpensive and readily available markers that may assist in early risk stratification when interpreted together with perinatal and clinical variables.

INTRODUCTION

Transient tachypnea of the newborn is a disorder of delayed fetal lung fluid clearance that typically presents within the first few hours after birth with tachypnea, mild retractions, nasal flaring, and variable oxygen requirement.[1-3] Chest radiography commonly demonstrates hyperinflation, prominent perihilar markings, and fluid in the interlobar fissures, although diagnosis remains clinical and depends on exclusion of other causes of neonatal respiratory distress.[2,4,5]

TTN is generally considered benign and self-limited, yet it is one of the most common reasons for NICU admission among otherwise mature newborns.[2,3] The principal diagnostic challenge is distinguishing TTN from early-onset sepsis, pneumonia, meconium aspiration, respiratory distress syndrome, persistent pulmonary hypertension, and congenital heart disease during the first hours of life, when symptoms may overlap substantially.[2,4,5]

Several epidemiologic studies have shown that cesarean delivery, especially in the absence of labor, late prematurity, and male sex increase the likelihood of TTN.[4,9]

More recent investigations have focused on whether routine hematologic indices can identify infants likely to follow a prolonged or more severe course. RDW has been examined as a low-cost marker of inflammatory and physiologic stress, whereas platelet count and platelet-derived indices have been

associated with tachypnea duration and severity of respiratory support requirement.[6,7,10]

MATERIALS AND METHODS

Study design and setting: It was a prospective observational study conducted in the neonatal unit of a tertiary care teaching hospital with inborn deliveries and level III neonatal intensive care facilities.

Participants: Newborns were eligible if they were born at or beyond 34 weeks' gestation, developed respiratory distress within 6 hours of birth, and had a final diagnosis of TTN based on clinical course and supportive chest radiographic findings where indicated.[2,4,5] Infants with congenital heart disease, suspected or confirmed sepsis, pneumonia, meconium aspiration syndrome, respiratory distress syndrome, major congenital malformations, or severe birth asphyxia were excluded.[2,4,5]

Sample Size: All eligible neonates diagnosed with TTN during the study period were consecutively enrolled. A total of 126 neonates fulfilled the inclusion criteria and were included in the final analysis.

Data collection: Maternal and neonatal variables included maternal age, parity, diabetes, hypertensive disorders of pregnancy, gestational age, sex, birth weight, mode of delivery, Apgar scores, and need for delivery room resuscitation. Respiratory variables included respiratory rate, work of breathing, peak oxygen requirement, need for CPAP, duration of oxygen therapy, and NICU length of stay. Laboratory parameters included complete blood count indices, particularly RDW and platelet count.[6,7,10]

Radiographic and laboratory evaluation: Chest radiography was performed when clinically indicated to support the diagnosis of TTN and to exclude alternative disorders. Complete blood count was obtained as part of routine neonatal assessment. RDW was recorded as a percentage and platelet count as $\times 10^3/\mu L$. These markers were chosen because they are routinely available and have been studied as potential correlates of TTN severity.[6,7,10]

Outcome measures: The primary outcome was prolonged TTN, defined as respiratory distress requiring oxygen therapy or positive airway support for more than 48 hours. Secondary outcomes were total duration of oxygen therapy, CPAP requirement, and length of NICU.[6,7]

Statistical analysis: Continuous variables were summarized as mean ± standard deviation or median with interquartile range, as appropriate. Categorical variables were expressed as number and percentage. Between-group comparisons were performed using Student's t test, Mann–Whitney U test, chi-square test, or Fisher's exact test. ROC curve analysis was used to assess the discriminatory performance of RDW and platelet count. Multivariable logistic regression was used to evaluate independent predictors of prolonged TTN.

Ethical Consideration: The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments. Written informed consent was obtained from the parents or legally authorized guardians of all enrolled neonates prior to inclusion in the study. Confidentiality of participant information was maintained throughout the study, and all data was anonymized before analysis.

RESULTS

Cohort characteristics

A cohort of 126 neonates with TTN was analyzed. Of these, 78 (61.9%) were male and 86 (68.3%) were delivered by cesarean section. Mean gestational age was 37.1 ± 1.3 weeks and mean birth weight was 2890 ± 410 g. Twenty-three infants (18.3%) required CPAP support, and the median duration of oxygen therapy for the entire cohort was 28 hours.

Comparison by disease duration

Forty-four infants (34.9%) had prolonged TTN lasting more than 48 hours. Compared with infants whose tachypnea resolved within 48 hours, those with prolonged TTN had significantly lower gestational age, lower birth weight, higher RDW, lower platelet count, greater oxygen exposure, and longer NICU stay. Cesarean delivery was also more common in the prolonged TTN group.

Biomarker performance

RDW greater than 17.4% showed fair discrimination for prolonged TTN, with an area under the ROC curve of 0.76. Platelet count below 190 $\times 10^3/\mu L$ had an area under the ROC curve of 0.72. When RDW and platelet count were combined with gestational age and mode of delivery, the area under the ROC curve increased to 0.83.

Multivariable analysis

In this study, RDW greater than 17.4%, platelet count below 190 $\times 10^3/\mu L$, gestational age below 37 weeks, and cesarean delivery remained independently associated with prolonged TTN, whereas male sex and low birth weight were not independently significant after adjustment.

Table 1: Baseline characteristics of the newborn enrolled in this study

Variable	Total cohort (n = 126)
Male sex	78 (61.9%)
Caesarean delivery	86 (68.3%)
Gestational age, weeks	37.1 ± 1.3
Birth weight, g	2890 ± 410
5-minute Apgar score	8.6 ± 0.7

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Maternal gestational diabetes	19 (15.1%)
Pregnancy-induced hypertension	14 (11.1%)
CPAP required	23 (18.3%)
Oxygen duration, h	28 (18–46)
NICU stay, days	4.0 ± 1.6
Prolonged TTN (>48 h)	44 (34.9%)

Table 2: Comparison of infants with and without prolonged TTN

Variable	TTN ≤48 h (n = 82)	TTN >48 h (n = 44)	p value
Male sex	47 (57.3%)	31 (70.5%)	0.15
Caesarean delivery	50 (61.0%)	36 (81.8%)	0.02
Gestational age, weeks	37.5 ± 1.1	36.4 ± 1.2	<0.001
Birth weight, g	3010 ± 380	2670 ± 390	<0.001
RDW, %	16.5 ± 0.8	17.8 ± 1.1	<0.001
Platelet count, $\times 10^3/\mu L$	236 ± 41	176 ± 38	<0.001
Oxygen duration, h	21 (14–30)	58 (49–72)	<0.001
CPAP required	7 (8.5%)	16 (36.4%)	<0.001
NICU stay, days	3.2 ± 1.0	5.5 ± 1.4	<0.001

Table 3: Predictive performance of biomarkers for prolonged TTN

Marker	Cutoff	AUC	Sensitivity	Specificity	PPV	NPV
RDW	>17.4%	0.76	72.7%	69.5%	56.1%	82.6%
Platelet count	$<190 \times 10^3/\mu L$	0.72	68.2%	66.1%	52.6%	79.4%
Combined (RDW & Platelet count)	—	0.83	77.3%	75.6%	63.0%	86.1%

(RDW: Red Cell Distribution Width, AUC: Area Under the Curve, PPV: Positive Predictive value, NPV: Negative Predictive Value)

Table 4: Multivariable logistic regression for prolonged TTN

Variable	Adjusted odds ratio	95% confidence interval	p value
RDW >17.4%	3.41	1.62–7.19	0.001
Platelet count $<190 \times 10^3/\mu L$	2.88	1.34–6.20	0.007
Gestational age <37 weeks	2.65	1.21–5.80	0.01
Caesarean delivery	2.29	1.04–5.03	0.04
Male sex	1.42	0.68–2.98	0.34
Birth weight <2500 g	1.89	0.82–4.32	0.13

(RDW: Red Cell Distribution Width)

DISCUSSION

TTN remains the most frequent neonatal respiratory disorder and a major cause of short-term NICU care in late preterm and term infants.[1-3] Although the disorder usually resolves with supportive management, a substantial minority of infants experience prolonged symptoms and require sustained oxygen therapy or noninvasive respiratory support.[2,3]

In this study, higher RDW and lower platelet count were associated with a longer clinical course. These findings are consistent with prior reports suggesting that hematologic indices may reflect the degree of physiologic stress or inflammatory activation during neonatal respiratory transition.[6,10,12] RDW is particularly attractive because it is inexpensive, universally available, and rapidly obtained from standard complete blood count testing.[6,12]

The association between lower platelet count and prolonged TTN is also supported by prior studies of platelet-related markers, including platelet mass index, in infants with TTN.[7,10] The biologic basis may involve altered pulmonary vascular transition, inflammatory signaling, or platelet consumption in the setting of respiratory adaptation, although the precise mechanism remains uncertain.[7,10,12]

The observed associations with cesarean delivery and lower gestational age are in keeping with the established epidemiology of TTN. Infants born by cesarean section without labor have less catecholamine-mediated lung fluid clearance, which predisposes to delayed adaptation after birth.[3,4,9] Likewise, infants born at the lower end of the late preterm or term range may have less efficient fluid resorption and thus a greater likelihood of prolonged tachypnea.[2,9]

A major strength of this study is its prospective design and inclusion of a well-defined cohort of neonates with carefully established diagnoses of TTN after exclusion of other causes of respiratory distress. Furthermore, the study evaluated readily available hematological parameters that can be obtained from routine complete blood count testing without additional cost or invasive procedures. These features enhance the potential clinical applicability of the findings, particularly in resource-limited settings where advanced biomarkers may not be readily available.

Limitations

The present study has certain limitations. First, it was conducted at a single tertiary-care referral center, which may limit the generalizability of the findings to other healthcare settings. Second, although the sample size was adequate to identify significant associations, larger multicenter studies are required to validate the predictive performance of RDW and platelet count across diverse neonatal populations. Third, serial measurements of hematological and inflammatory biomarkers were

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not performed; therefore, temporal changes in these parameters could not be assessed. Finally, causality cannot be inferred because of the observational study design, and the identified predictors should be interpreted as markers associated with prolonged TTN rather than definitive determinants of disease severity.

CONCLUSION

TTN is typically a benign and self-limited disorder, but a clinically relevant subgroup of infants may require prolonged oxygen therapy and CPAP support. In this study RDW and platelet count emerged as practical early predictors of prolonged TTN when interpreted in conjunction with gestational age and delivery mode. These findings support the rationale for considering the routine hematologic markers as adjuncts to early severity assessment.[6,7,10]

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